How to Cite:
Nizaruddin, M. A., & Yunus, N. H. M. (2022). Community Pharmacy Health Screenings: Aiding in assessing occurrence of obesity and associated factors amongst the community population. *International Journal of Health Sciences*, *6*(S7), 5359-5375.
https://doi.org/10.53730/ijhs.v6nS7.13080

Community Pharmacy Health Screenings: Aiding in assessing occurrence of obesity and associated factors amongst the community population

Mariani Ahmad Nizaruddin*
Faculty of Pharmacy, University of Cyberjaya, 63000 Cyberjaya, Selangor, Malaysia.
*Corresponding author: mariani@cyberjaya.edu.my

Nur Huda Md Yunus
Faculty of Pharmacy, University of Cyberjaya, 63000 Cyberjaya, Selangor, Malaysia.

***Abstract*---**The increase of obesity among Malaysians is recognized as a health concern on par with hypertension and diabetes. Early detection such as health screenings and prevention via education, can reduce morbidity and mortality. Conducting health screenings through community pharmacies may be a good choice considering the easy access to the community. This study aimed to investigate the possible factors such as demographic (age, gender, family history of obesity) and lifestyle (exercise habit, frequency of eating outside, smoking behaviour) that are associated with occurrence of obesity. This was a cross-sectional study in an area of Johor, utilising a guided data collection form. Body Mass Index (BMI) was used as the parameter for obesity status. According to Clinical Practice Guideline on Management of Obesity 2004, Body Mass Index (BMI) of 27.5 kg/m² and more is considered obese. A total of 183 respondents revealed 62 (33.9%) were obese and 121 (66.1%) were not obese. Both family history of having obesity and exercise habit were significantly associated with BMI values that could be related to risk in obesity, while age and frequency of eating outside had no significant correlation and association respectively. For BMI and family history of having obesity, the mean BMI values of obese respondents with family having obesity was 32.55 kg/m² (p=0.044). The significant mean difference of BMI among different exercise habits showed mean BMI values of 26.29 kg/m² for respondents that do not exercise (p=0.017). When related to obesity status (obese or non-obese), it was found that age, gender, and smoking behavior

Manuscript submitted: 9 May 2022, Manuscript revised: 18 July 2022, Accepted for publication: 27 August 2022

showed no significant association (P value of less than 0.05). This study demonstrated that public health screenings by community pharmacist aids in identifying occurrence of obesity in the community population. Aiding in obesity intervention requires engagement with community pharmacists due to the multifactorial issues at play.

***Keywords*---**Body Mass Index (BMI), demographic and lifestyle factors of obesity, health screening by community pharmacist.

Introduction

Obesity is defined as abnormal or excessive fat accumulation in the body that could lead to impairment in health that affects an individual's quality of life. However, obesity is not determined solely by body fat only. Body Mass Index (BMI) is nowadays a common indicator to classify both overweight and obesity. BMI simply uses weight and height as the parameter involved, obtaining value of a person's weight in kilogram divided by square of his height in meters (unit: kg/m^2). For adults, World & Health Organization (WHO) defines obesity is a BMI greater or equal to $30kg/m^2$.[8]

Body Mass Index (BMI*)*

Currently this is the most established and commonly used worldwide. According to WHO classification, the cut-off point for overweight is 25 kg/m^2 and obesity is $30kg/m^2$. This indicator has been used for quite some time to classify obesity. However, when it comes to co-morbidities in relation to obesity, evidence from several Asian countries such as Singapore, China, Japan, India and Hong Kong showed risk of co-morbidities begin to rise at lower BMI values than the stated cut-off points. Many Asian populations have higher body fat percentage even when at similar BMI compared to Caucasian/European populations. This explains the fact that BMI alone is not enough to define obesity and identify risk of co-morbidities. [4]

Body Fat (BF) Percentage and Waist Circumference (WC*)*

BMI has been used as standard parameter to classify obesity, WHO was aware of the limitation. For those reasons, WHO has recommended the research into using cut-off point for total body fatness and visceral fat for certain subgroup of age, race and gender. This to evaluate and make the definition of obesity by WHO into practice which state that obesity is condition with excessive fat ac cumulation in the body to the extent that it can affect health condition and quality of life. The study first stated the relationship between BMI and Body Fat percentage which then determine the risk for comorbidities at different BMI categories. Apart from that, relationship between abdominal obesity (measured by waist circumference) with cardiovascular risk factor was also determined. Based on this study, it can be said that waist circumference and body fat are good indicator to be used together with BMI to classify obesity accurately and knowing risk of co-morbidities. [21] Measurement by Waist Circumference (WC) is simple and related

with abdominal fat content which can determine abdominal obesity. WC is also to be said as an independent risk factor for cardiovascular disease and very useful for individuals with normal and overweight BMI. The reason why those who has BMI more than 35 kg/m² is unnecessary to measure WC is because it would negate its predictive value. It is crucial to recognize abdominal obesity as the risk of cardiovascular disease is greatest in patient with abdominal obesity. [21] The main objective of this study was to investigate the factors (demographic and lifestyle) associated with the occurrence of obesity in Johor using health screening by community pharmacist as medium. The factors associated with obesity is crucial to be identified to aid intervention done by professional healthcare providers.

Public health screening by community pharmacist

Generally, retail or community settings play vital role in providing public services that are easily reachable by public. World Health Organization (WHO) recognized community pharmacies and their pharmacists as easily accessible and approachable by public who seek for health advice. They play an important role in health intervention and positive impact on the delivery of public health initiatives. In England for example, there are 10,500 community pharmacies both in urban and rural areas available for public access for healthcare without any appointment, open at specific times even during weekends that are convenient for groups of people with various range of working hours. Identified by Department of Health for England, community pharmacists are known as public ser vice providers who aim to reduce the obesity problem that is becoming one of the most significant risk factors of mortality and morbidity in middle and high-income countries through different kind of approaches including health screening.[20]

Factors of obesity (Socio-demographic and lifestyle)

Age

A morbidity survey on prevalence of obesity, and abdominal obesity among Malaysian elderly stated that overweight and obesity decreased with age [9]. A finding on the prevalence of obesity in United States revealed that adult age 60 and above are more likely to be obese compared to younger adult. It also showed that older women were more likely to be obese while there was no significant different by age in obesity prevalence among men. Another cross-sectional study on the relationship between BMI and Body Fat percentage estimated by bioelectrical impedance in group of Sri Lankan adult revealed that BMI increases with age in young group, constant in middle age and decline in elderly in both female and males. These studies above showed there was association between age and obesity or BMI even though all of them revealed relatively different outcomes. [13]

Race

Demographic characteristics and lifestyle factors to study require inclusion of ethnicity or race. The differences in culture, taste, diet and religion are some of

the factors that could influence the likelihood of obesity among different races. Evidence shows among ethnics in Malaysia, Chinese (9.3%) and others (5.5%) ethnics groups are less likely to be obese when compared with Ma lays. [19]

Gender and occupation

In developing countries, most women are greatly affected by changes in occupation, type or workload required to complete certain tasks, and social habit that affect physical activity when it comes to weight gain compared to men. This explains the fact that there are more overweight and obese women in these developing countries compared to men. Apart from that, increase consumption of energy-dense foods high in refined

carbohydrates make excess weight gain affect more on women as women usually practice more sedentary working life compared to men. Gender appears to be more affected in developing countries by sociocultural beliefs and values on physical activity when it comes to excess weight gain. [10]

Genetic factor and family medical history

Genes can greatly influence human eating behaviour which explains that some part, obesity can be said as genetically determined disorder of appetite behaviour. A study identified a region on chromosome 10p12 that showed significant relation with obesity in several populations whereas Heid et al stated that variant in MC4R receptor which present only in 2-3% among general population found to be able to reduce risk of obesity [6]. This could be concluded that some populations are prone to being obese and some are not, depending on their genetics. Besides that, family history of members being overweight or obese could be another factor besides genetics itself that make an individual prone to this condition. Studies in obesity in adolescents associated with perinatal risk factors, parental BMI and socio-demographic characteristics conclude that having parents that are overweight or obese could lead to risk of their children also being overweight or obese based on habits and lifestyle that these parents put on the children.[1]

Eating habits

A cross sectional study was conducted to study the effect of eating habits among university students in

Malaysian medical school and its associated social and psychological factors [18] The overgrowing of shopping malls, convenience stores, vending machines and fast -food outlets as easy and most convenient access have created a situation for young adults to practice unhealthy eating habits. Some common unhealthy eating patterns among Malaysian young adults included meal skipping, eating away from home, snacking and fast-food consumption. Although it has been shown that genetic factors play a major role in the risk of developing obesity, modifiable environmental factors such as dietary and lifestyle practices are also considered important in the increasing rates of obesity especially childhood obesity. [12] Another study was carried out to determine the association between

infrequent breakfast consumption with higher body adiposity and abdominal obesity in Malaysian school-aged adolescents. The main findings of this study indicated that breakfast skipping or infrequent breakfast consumption amongst adolescents was significantly associated with higher dual-energy X-ray absorptiometry (DXA)-determined total body adiposity, abdominal obesity, assessed by WC and body weight, compared to those who habitually ate breakfast, after taking into consideration the other potential factors. Hence, it could be concluded breakfast is not really a choice, but a necessary habit [10]. It can be concluded that unstable dieting and skipping meals causes an individual to suffer from the problems of overweight or obesity. A study in 2012 about social and psychological factors affecting eating habits among university students in a Malaysian medical school that most of the respondent when asked about reason or habit of eating is “eat because of feeling lonely”, “feel out of control when eating”, “eat so much until stomach hurts”, “eat because of feeling upset or nervous” and “eat because of feeling happy”. Most of these reasons correlate with feelings or emotional control. [7]

Physical activity

A cross sectional, multicentre study conducted among children aged 0.5-12 years in four countries, Indonesia, Malaysia, Thailand and Vietnam found an association between daily physical activity and screen time but no other sedentary activities with the measures of obesity during childhood. From this survey, obese children in Malaysia spent less time on physical activities and had longer periods of sedentary activities as compared to normal weight children. The study also revealed that rural children had higher daily step counts than urban children. A possible explanation for this may be that rural children had higher outdoor activities as they have more opportunities available to them living in a natural environment. [11]

A quasi-experimental study in which a physical intervention training for 8 weeks with pre and post BMI data collection was which aimed to investigate the effectiveness of 8 weeks physical activity program among obese students of SJKT Barathi Hutan Melintang, Perak in year 2015. From this studied program, the result showed successfully reduced obesity level with two of the respondents who were in obese class I moved to pre obese levels whereas seven students moved to normal level. This study concluded that increase in physical activity could contribute to decrease in obesity levels which is a good finding to start any obesity management among school-aged Malaysian. Martins, Marialva, Afonso, Gameiro and Costa, did a study on the *effect of a 8-week physical activity program on body composition and physical fitness on obese and pre-obese female* students'. This study then proved that obese students‟ participation in the activities of physical activity could reduce their weight dramatically. [15]

Emotional status or stress level

On the other study on contributing factor of obesity among stresses adolescents, stated that obesity is a consequence of stress among adolescents and is exacerbated by the wrong eating attitude. [17] This condition could be said as one factor of obesity that leads to another factor which could lead to abnormal

eating habit or binge eating. Developing proper food choices among adolescents can help prevent obesity and other complications in adulthood.

According to a study, acute stress greatly affects eating habit. Some studies did show that some individual take lower food consumption under acute stress. However, acute stress can also cause increase food intake especially highly flavoured, calories-dense food. For example, 42% of students were reported consume high food intake when in stress and 73% of them snaking frequently when stress. Laboratory studies on one third to half of animal or human shows increase in food consumption during acute stress. Emotional status can affect greatly on eating habit which may results in gaining or losing weight.

Opposite to depression which usually shows sign of decreased food intake and abrupt weight loss, stress results in increasing food intake and body weight gain. Apart from that, low physical activities among stressed adolescents also contribute to obesity among them. It is said that in response to acute or chronic stress, eating behaviour may be affected especially in adolescent. Some believes that stress is contributing factor of getting obesity and inducing appetite. Level of stress is also another factor that affects eating habit. This is supported by the fact that moderate or severe stress level in adolescents will significantly affect BMI reading in a way that they have higher BMI and shows increase consumption of sweet and high fat foods compared to adolescents under mild stress level. Studies show that stress can influence eating habit in short term through reduce food intake while in long term, increasing intake of sweet and high fat foods, increasing blood pressure, slowing gastric emptying and activation of adrenaline. From long term mechanism, it can be concluded that obesity is not only affected by food intake but also by food choices. [17]

Smoking behaviour

There is general belief that smoking could possibly prevent weight gain and this had affected smoking behaviour especially among young women watching their weight. A cross-sectional study on relationship between smoking and obesity concluded that it is maybe too extreme to say that smoking can prevent obesity and this kind of perception must be cleared among public. [5]. It is advisable to include weight management in the smoking cessation program as quitting smoking may lead to temporary weight gain. Another study on cigarette smoking, nicotine and body weight [2], girls in adolescence continue smoking for the purpose of weight control. The perception of smoking preventing weight gain and can control appetite making smoking as one of the “diet strategy” to be applied by most public especially young women. This opinion also making it hard for them to quit smoking as they might gain some weight and have more appetite compared to when they were smoking.

2. Methodology

Sample population

Sample population of this study was adult customers aged 18 years old and above attending health screenings at community pharmacies around Johor with.

The estimated customers who went for free health screening organized by certain outlet of community pharmacy were 50 per day. Respondent informed consent form was distributed to all respondents to get their permission prior to data collection. 183 respondents had participated in this study according to the required criteria.

Study site

This study was conducted at selected community pharmacy in Johor especially the one that organized free health screening day. Some of the area that had free health screening day by community pharmacy was in Parit Sulong, Ta man Tunku Aminah, Rengit and Taman University, Skudai.

Sampling method

The sampling technique used in this study was convenient sampling. The customers were invited for screening at the community pharmacies conducting health screening days. 183 respondents were able to be included in the study due to incomplete form and several limitations in finding the respondents needed. The number of respondents included was 47.7% of the total sample needed which were acceptable since response rate of 20% was reported of a survey being published in high quality professional journal despite a low response rate [3]. Respondents who come for health screening were explained about the study conducted and asked to fill a consent form. Respondents‟ height, weight, and body mass index (BMI) were taken by using standardized and calibrated instruments. All these procedures were done by community pharmacist on duty during health screening session with the respondents. The data obtained filled by researcher in the survey and if necessary, direct approach to the respondents were done to ask a few questions related to lifestyles (diet and physical activity).

Data collection and data analysis

A guided survey (using data collection form) was used in this study, consist of Malay and English language. The data collection form was adopted and adapted from a study by S.E Kelling in the article of Provision of Preventive Service by Community Pharmacists (2016). The guided survey using data collection form consisted of two section, Section A and Section B. Section A consist of respondents' demographic and lifestyle information. Section B consist of data collected on respondents' Body Mass Index (BMI). The data was analysed using Package for Social Science (SPSS) Version 21 on Windows 7. Descriptive statistics (mean, standard deviation, frequency, percentage) was used to summarize the data obtained. Normality test for Body Mass Index (BMI) and age was applied to check for the normality of continuous variables. Since both BMI and age was normally distributed, all tests using them were using parametric test. Chi Square was conducted to identify the association between obesity status and gender as well as smoking behaviour. Pearson's correlation test was used to correlate the BMI values according to different age whereas One-way ANOVA was used to find the mean difference of BMI among different frequency of respondents eating outside. Independent t-test was applied to know the mean difference of BMI among family history of having obesity and exercise done by respondents. P value

of less than 0.05 ($p<0.05$) was taken as statistically significant.

3. Results and discussion

Demographics of the respondents

The mean age of the total respondents was 48.89 years with Standard Deviation of ±15.91. Majority of respondents participated in this study were Malay with percentage of 42.6% (n=78), Chinese with 38.8% (n=71) as well as Indian and other races with 15.3% (n=28) and 3.3% (n=6) respectively. This finding of races distribution represents the current reported population of Johor by races where the highest population consist of Malays with 2,029 population followed by 1,099 Chinese, 237 Indian and 19 other populations. Majority of the participated respondents were females (70.5%, n=129). As many as 59.6% (n=106) were unemployed and 40.4% (n=74) employed This is most probably due to majority respondents retired or housewives. Health screening days were held during the weekdays from 9am until 1pm which probably explained that maybe most of the respondents that could join the event were those who unemployed (retired, housewives, etc

Table 1 Demographic data of the respondents

Characteristics	Frequency, N (%) ± SD	Mean
Gender		
Male	54 (29.5)	
Female	129 (70.5)	
Age	± 15.91	48.89
Race		
Malay	78 (42.6)	
Chinese	71 (38.8)	
Indian	28 (15.3)	
Others	6 (3.3)	
Employment status		
Employed	74 (40.4)	
Unemployed	109 (59.6)	
Family medical history		
Non-obese	181 (98.9)	
Obese	2 (1.1)	
Past medical history		
Non-obese	178 (97.3)	
Obese	5 (2.7)	

The mean Body Mass Index (BMI) of the respondents was 25.61 kg/m² with SD of ± 4.90. According to the Body Mass Index (BMI), majority of the respondents were

non-obese with a percentage distribution of 66.1% (n=121) and the rest 33.9% (n=62) were obese.

Table 2 Body Mass Index (BMI) data of the respondents

Characteristics	Frequency, N (%)	Mean ± SD
Body Mass Index (BMI)		25.61 ± 4.90
Obesity status		
Obese	62 (33.9)	
Non-obese	121 (66.1)	

SD = standard deviation

Table 3 Data of respondents regarding diets and physical activities

Characteristics		Frequency, N (%)
Smoking		
	Yes	10 (5.5)
	No	173 (94.5)
Exercise		
	Yes	71 (38.8)
	No	112 (61.2)
Exercise frequency		
	None	112 (61.2)
	Once a week	44 (24.0)
	2-3 sessions per week	15 (8.2)
	More than 4 sessions	12 (6.6)
Eat outside or fast food consumption		
	Rarely or never	90 (49.2)
	A few times a month	3 (1.6)
	A few times a week	66 (36.1)
	One meal a day	24 (13.1)
Sweet drinks consumption		
	Rarely or never	61 (33.3)
	Once a day	107 (58.5)
	At every meal	15 (8.2)

Correlation between Body Mass Index (BMI) and age

The result of the analysis had found a weak negative correlation between the age of the respondent and the value of their Body Mass Index (BMI) ($r = -0.11$). However, from the result of analysis, it showed that there was no significant correlation between BMI and age of the respondent ($p = 0.885$). This finding is

contrasted with similar regarding the study of relationship between BMI and body fat percentage estimated by several factors in Sri Lankan adults, which note that age was a significant predictor variable on BMI in regression model ($p < 0.01$) [14]. BMI then was shown to increase with age in young, relatively constant in middle age and decline in elderly. This difference in founding probably due to difference in methodology factors which includes sample size, respondent involved and other exposed variables.

Table 4 Correlation between BMI and age

Variable	Age (years) N = 183
Body Mass Index (BMI)	(-0.11)[b] (0.885)*

[b] Pearson's correlation coefficient

*$p < 0.05$ statistically significant

Correlation between Body Mass Index (BMI) and age of respondents

As depicted in Table 5 had found a weak negative relationship between the age of respondent and Body Mass Index (BMI) ($r = -0.11$). However, from the result of analysis, it showed that there was no significant correlation between BMI and age of the respondent ($p = 0.885$). This finding contrasts a study of relationship between BMI and body fat percentage estimated by several factors in Sri Lankan adults, which note that age as a significant predictor variable on BMI in regression model ($p < 0.01$) [14]. BMI then was shown to increase with age in young, relatively constant in middle age and decline in elderly.

Table 5 Correlation between Body Mass Index (BMI) and age of respondents

Variable	Age (years) N = 183
Body Mass Index (BMI)	(-0.11)[b] (0.885)*

[b] Pearson's correlation coefficient

*$p < 0.05$ statistically significant

Association between obesity status and smoking behavior of respondents

The result of the analysis showed that there was no significant association between obesity status and smoking behavior of respondent ($p = 0.674$). This finding is contrasted with a study conducted to find the relationship be- tween smoking and obesity (defined by BMI) among adult in UK population that revealed significant association between smoking status and obesity status [5]. Using univariate analysis, it showed that current smokers were less likely to be obese

compared to the one who never smokes (OR = 0.91, p< 0.001) whereas former smokers were more likely to be obese than current smokers (OR = 1.20, p < 0.001) and the one who never smokes (OR = 1.09, p< 0.001). The difference in the finding between these two studies is most probably due to methodological factors and target of the respondent. According to the referred study, current smokers were less likely obese but it is not statistically significant in the youngest age group and in those who had quit smoking for quite a long time before.

Table 5 Association between obesity status and smoking behaviour

	Smoking	Non-smoking	X^2 statistic (df)	P value*
Obese	4 (6.5%)	58 (93.5%)	0.177 (1)	0.674
Non-obese	6 (5.0%)	115 (95.0%)		

Pearson Chi Square

*p < 0.05 statistically significant

Relationship between Body Mass Index (BMI) and family history of obesity

There was significant difference between family of respondent having obesity and BMI of the respondent

(p = 0.044). Hence, it could be said that having family background with obesity would affect the BMI of the respondent. This finding is consistent with a similar study on obesity in adolescence associated with perinatal risk factor, parental BMI and socio-demographic characteristics that revealed children of obese parents significantly more likely to be obese (Odds ratio (OR) of 2.49 and 3.79 for obese father and mother, respectively). The obesity status in the study was classified using BMI as well [1]. This finding is probably due to overweight or obese family history can be a crucial predictor of the genetic risk in being overweight or obese especially during childhood. However, inheritance of gene might not be the only factors that could expose to obesity when it comes to family history. The unhealthy environment that the parents create in their children life also could affect the susceptibility of an individual having obesity in terms of eating habit and physical activity.

Table 6 Relationship between BMI and family history of obesity

Family medical history	Body Mass Index (BMI) Mean (SD)	P value*
Obese	32.5500 (3.04056)	0.044
Non – obese	25.5337 (4.87129)	

Independent samples t-test

*p < 0.05 statistically significant

Association between obesity status and gender

Based on the analysis, it was found that there was no association between obesity status of the respondents with their gender ($p = 0.559$). This data was contrasted with the finding sof another study which found that gender is a significant predictor to BMI-BF% relationship on a cross sectional study of relationship between BMI and body fat percentage by several factors in a group of Sri Lankan adults [14]. As by definition by World Health Organization (WHO), obesity is not only defined by excess weight but also by excess body fat per se [8]. In this study, mean BMI values were seen significantly higher in females ($p<0.000$) compared to males ($p<0.05$) in both middle age and elderly except in young age group (18-39 years old). Better fit of curvilinear curve in female regarding the BMI were seen in females having BMI values more than 30 kg/m^2 which classified as obese according to WHO. This showed that effect of different gender was more significantly seen with higher BMI values specifically in obese class. Multiple regression analysis was also conducted in the same study showed a significant effect on the relationship of BMI-BF% by gender and age with more effect was seen by gender (Beta, $\beta = 0.586$, $p < 0.000$). The most common pat- tern seen was higher body fat percentage in females when compared to males in full range of BMI values regarding the obesity status ($p<0.000$).

Table 7 Association between obesity status and gender

	Female	Male	X^2 statistic (df)	P value*
Obese	42 (67.7%)	20 (32.2%)	0.341 (1)	0.559
Non-obese	87 (71.9%)	34 (28.1%)		

Pearson Chi Square

*$p < 0.05$ statistically significant

Relationship between Body Mass Index (BMI) and exercise

BMI was significantly different in respondents who exercised ($p = 0.017$). This data is consistent with a study to assess the effectiveness of 8 week physical activity program among obese student, which then revealed the reduction in mean score of post-test compared to pre-test (Post-test ; $M = 23.73, SD = 0.9030$; Pre-test ; $M = 24.72, SD = 0.9035$; $p = 0.000$)[15]. This proved that there was significant difference be- tween pre and post test result. The finding showed that 2 respondent who were in obese class I moved to pre obese class and seven more moved to normal level. This shows that physical activity might reduce both body weight and BMI levels. Physical activity could affect positively on BMI of and individual.

Table 8 Relationship between BMI and exercise

Exercise	Body Mass Index (BMI) Mean (SD)	P value*
No	26.2885 (4.58726)	0.017
Yes	24.5157 (5.22712)	

Independent sample t-test

*p < 0.05 statistically significant

Relationship between Body Mass Index (BMI) and frequency of respondents eating outside

From the analysis conducted, it showed that there was no significant mean difference of BMI among different frequency of respondents eating outside (p = 0.233). In contrast, a literature review regarding the association between eating out of home and body weight concluded that there is positive relationship between the outside of home food consumption and weight gain or obesity although there were many different methodological studies performed [3]. The literatures include cross-sectional studies and prospective cohort studies which searched from Medline, Embase, Lilacs, The Cochrane Library and ISI Web of Knowledge. Generally, cross-sectional studies conclude that outside from home food especially fast food greatly increased the BMI up to 1.12 kg/m² in men and 1.55 kg/m² in women, whereas restaurant food increased BMI by 0.93 kg/m² in men and 1.24 kg/m² in women. Founding by the same literature review, among 20 cross-sectional studies that investigate out of home or restaurant food consumption, only three of them showed positive association between eating out and BMI/overweight/obesity. One from them showed positive association among women only whereas the other two showed positive association among men only. Difference in our finding is most probably because the different understanding of term eating outside among respondents which can be said as the limitation of this study. Some of the respondents might understand that fast food consumption only considered as eating outside and others might understand that any kind of food regardless healthy or not as long as not prepared at home as outside home food. Besides that, as for the finding of there was no significant mean different of BMI among different frequency of respondents eating outside was most probably supported by the fact that eating outside is not equal to eat unhealthy food or high calorie food intake. Hence, it can be concluded that it is not a matter of frequency of eating outside but a matter of type of food consumed in terms of the nutrients, calorie and fat content that may affect the BMI and obesity

Table 9 Relationship between Body Mass Index (BMI) and frequency of respondents eating outside

Frequency of eating outside	Body Mass Index (BMI) Mean (SD)	P value*
Rarely or never	25.973 (5.784)	0.233
A few times a month	23.200 (7.034)	
A few times a week	24.809 (3.462)	
One meal a day	26.754 (4.270)	

One-way ANOVA test

*p < 0.05 statistically significant

Association between obesity status and smoking behavior of respondents

The result of the analysis showed that there was no significant association between obesity status and smoking behavior of respondent (p = 0.674). This finding is contrasted with a study conducted to find the relationship be- tween smoking and obesity (defined by BMI) among adult in UK population that revealed significant association between smoking status and obesity status [5]. Using univariate analysis, it showed that current smokers were less likely to be obese compared to the one who never smokes (OR = 0.91, p< 0.001) whereas former smokers were more likely to be obese than current smokers (OR = 1.20, p < 0.001) and the one who never smokes (OR = 1.09, p< 0.001). The difference in the finding between these two studies is most prob- ably due to methodological factors and target of the respondent. According to the referred study, current smokers were less likely to be obese but it is not statistically significant in the youngest age group and in those who had quit smoking for quite a long time before.

Table 10 Association between obesity status and smoking behaviour

	Smoking	Non-smoking	X^2 statistic (df)	P value*
Obese	4 (6.5%)	58 (93.5%)	0.177 (1)	0.674
Non-obese	6 (5.0%)	115 (95.0%)		

Pearson Chi Square

*p < 0.05 statistically significant

Limitation

First, due to time limitation of this research, the data collection only can be conducted in small number of community pharmacies. Apart from that, due to the nature of this study that require health screening done by community pharmacist as medium of data collection, there is limitation in number of respondents that can be obtained besides not so many community pharmacies

that held health screening days on a weekly basis or even monthly basis. Therefore, the target sample that should be reached in this study is even harder to be achieved. Other than that, incomplete data collection form also had to be eliminated thus reducing the total sample size. In regard of the relatively small study population, it could not reflect the actual population of community pharmacies‟ customers that involved in health screening services by community pharmacists. Finally, despite the fact that there were quite lots of number of customers that involve in health screening by community pharmacies, not all of them were willing to give cooperation and theirs consent to participate in this study. Hence, this also became one of the factors that reduce the total sample size.

Conclusion

The fact that obesity is an overgrowing health concern worldwide and identified as one of the risks to other co-morbidities, healthcare providers are responsible in fostering strong awareness and education on dangers of obesity among public. This emphasised the factors especially demographically (age, gender, family history of obesity) and lifestyles factors (exercise habit, frequency of eating outside, smoking behaviour) that are associated with occurrence of obesity by conducting health screenings by community pharmacists. Body Mass Index (BMI) was chosen as the parameter of obesity status. There is significant mean difference of Body Mass Index (BMI) among different family history of obesity and exercise habit. However, there is no significant correlation between BMI and age, no significant mean difference of BMI among different frequency of eating outside. In relation to obesity status, there is no significant association when compared to gender and smoking behaviour. By recognising these factors amongst the public that the community pharmacists serve, they will be more adapt to deliver appropriate advice and counselling on health weight management.

Acknowledgement

Special gratitude to UoC Research Ethics Review Committee (CRERC) for approving this study.

References

[1] Article, O. (2013). Obesity in adolescence is associated with perinatal risk factors, parental BMI and sociodemographic characteristics, (September 2012), 115–121. https://doi.org/10.1038/ejcn.2012.176

[2] Benowitz, N. L. (2009). Cigarette Smokin , Nicotine , and Body Weight. *Clinical Pharmacology & Therapeutics*, *90*(1), 164–168. https://doi.org/10.1038/clpt.2011.105

[3] Bezerra, I. N., Curioni, C., & Sichieri, R. (2011). Association between eating out of home and body weight, 70(2), 65–79. https://doi.org/10.1111/j.1753-4887.2011.00459.x

[4] Clinical Practice Guidelines on Management of Obesity. (2004). Management of Obesity 2004. *Clinical Practice Guideline*, 1–31.

[5] Dare, S., Mackay, D. F., & Pell, J. P. (2015). Relationship between Smoking

and Obesity: A Cross-Sectional Study of 499, 504 Middle- Aged Adults in the UK General Population, 1–12. https://doi.org/10.1371/journal.pone.0123579

[6] Farooqi, I. S., & Rahilly, S. O. (2007). Genetic factors in human obesity, *8*, 37–40.

[7] Ganasegeran, K., Al-dubai, S. A. R., Qureshi, A. M., Al-abed, A. A. A., & Am, R. (2012). Social and psychological factors affecting eating habits among university students in a Malaysian medical school: a cross-sectional study, 1–7.

[8] Index, B. M. (2002). 3. Defining Obesity. *Obesity*, (Who 1998), 7–14.

[9] Jamaiyah, H., Geeta, A., Z, A. A., Rahmah, R., At, R., & Y, A. F. (2012). The Third National Health and Morbidity Survey: Prevalence of Obesity, and Abdominal Obesity Among the Malaysian Elderly Population. https://doi.org/10.1177/1010539510380736

[10] Kanter, R., & Caballero, B. (2012). Global Gender Disparities inObesity : A Review 1, 491–498. https://doi.org/10.3945/an.112.002063.published

[11] Lee, S. T., Wong, J. E., Shanita, S. N., Ismail, M. N., Deurenberg, P., & Poh, B. K. (2015). Daily physical activity and screen time, but not other sedentary activities, are associated with measures of obesity during childhood. *International Journal of Environmental Research and Public Health*, *12*(1), 146–161. https://doi.org/10.3390/ijerph120100146

[12] Nurul-fadhilah, A., Teo, P. S., Huybrechts, I., & Foo, L. H. (2013). Infrequent Breakfast Consumption is Associated with Higher Body Adiposity and Abdominal Obesity in Malaysian School-Aged Adolescents, 8(3), 1–6. https://doi.org/10.1371/journal.pone.0059297

[13] Ogden, C. L., Ph, D., Carroll, M. D., Kit, B. K., Flegal, K. M., & Ph, D. (2012). Prevalence of Obesity in the United States, 2009-2010, (82), 2009–2010.

[14] Ranasinghe, C., Gamage, P., Katulanda, P., & Andraweera, N. (2013). Relationship between Body mass index (BMI) and body fat percentage, estimated by bioelectrical impedance, in a group of Sri Lankan adults : a cross sectional study.

[15] Salimin, N., Elumalai, G., Shahril, M. I., & Subramaniam, G. (2015). The Effectiveness of 8 Weeks Physical Activity Program among Obese Students. *Procedia - Social and Behavioral Sciences*, *195*(2013), 1246–1254. https://doi.org/10.1016/j.sbspro.2015.06.273

[16] Sinha, R., & Jastreboff, A. M. (2013). Stress as a Common Risk Factor for Obesity and Addiction. *Biological Psychiatry*, *73*(9), 827–835. https://doi.org/10.1016/j.biopsych.2013.01.032

[17] Tajik, E., Afiah, N., Zulkefli, M., Baharom, A., Minhat, H. S., & Latiff, L. A. (2014). Contributing factors of obesity among stressed adolescents. *Electronic Physician*, *6*(1), 771–779. https://doi.org/10.14661/2014.771-778

[18] Tan, A. K. G., Dunn, R. A., Ismail, M., Samad, A., & Feisul, M. I. (2011). of Public Health. https://doi.org/10.1177/1010539509359535

[19] Tan, A. K. G., Dunn, R. A., Samad, M. I. A., & Feisul, M. I. (2011). Sociodemographic and health-lifestyle determinants of obesity risks in Malaysia. *Asia-Pacific Journal of Public Health*. https://doi.org/10.1177/1010539509359535

[20] Todd, A., Moore, H. J., Husband, A. K., Bambra, C., Kasim, A., Sniehotta, F. F., … Summerbell, C. D. (2014). Community pharmacy interventions for

public health priorities: protocol for a systematic review of community pharmacy-delivered smoking, alcohol and weight management interventions, 1–8.

[21] Yap, M. (2002). Elevated body fat percentage and cardiovascular risks at low body mass index levels among Singaporean Chinese, Malays and Indians Elevated body fat percentage and cardiovascular risks at low body mass index levels among Singaporean Chinese , Malays and I, (July 2015), 209–215. https://doi.org/10.1046/j.1467-789X.2002.00069.x